

Differentiation

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Based on
Introduction to Matrix Algebra, Autar Kaw
<https://ma.mathforcollege.com>

Outline

- 1 Background on Differentiation
 - Tangent and Secant Lines

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Secant Lines

- Let P $(a, f(a))$ and Q $(a + h, f(a + h))$ be two points on the curve
- the **secant line** is the straight line drawn through P and Q .
- the slope of the **secant line**

$$\begin{aligned}m_{\text{secant}} &= \frac{f(a + h) - f(a)}{(a + h) - a} \\ &= \frac{f(a + h) - f(a)}{h}\end{aligned}$$

Tangent Lines

- As Q moves closer and closer to P, $h \rightarrow 0$
the **secant line** becomes the **tangent line**
- the slope of the **tangent line**

$$\begin{aligned}m_{\text{tangent}} &= \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{(a+h) - a} \\ &= \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}\end{aligned}$$

